

# Combined Fractures of The Odontoid Process and Upper Thoracic Spine: A Case Report

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## Abstract

A 39-year-old male patient sustained a rare combination of a posteriorly displaced Type II odontoid fracture and a T5 rotational burst fracture after falling 4 meters. Despite the patient's significant spinal trauma, no neurological deficits were observed. The surgical intervention, which included anterior odontoid screw fixation and T1-T7 posterior fusion, was performed on the first post-injury day and was successfully completed. This case underscores the pivotal role of hyperextension and flexion-rotation forces in such injuries, while concurrently demonstrating the efficacy of combined surgical approaches in preserving neurological function in multilevel spinal trauma.

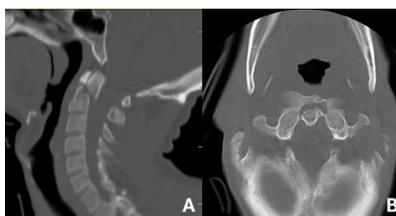
**Keywords:** Odontoid Fracture, Thoracic Fracture, Spinal Trauma, Surgical Stabilization

## 1. Introduction

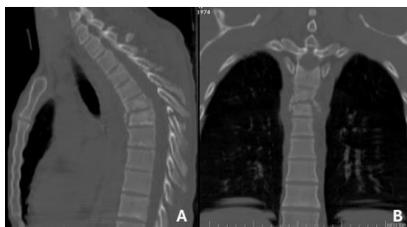
Concomitant fractures of the odontoid process and upper thoracic spine are exceptionally rare, with few reports in the literature [1,2]. The odontoid process, a critical stabilizer of the atlantoaxial joint, is vulnerable to high-energy trauma, while the upper thoracic spine, reinforced by the rib cage, typically requires significant force to fracture [3]. This particular case under consideration presents a unique combination of a Type II odontoid fracture and a T5 burst fracture-dislocation. Notably, these injuries were managed successfully without neurological compromise. This case offers insights into injury biomechanics and the role of tailored surgical strategies in complex spinal injuries.

## 1.1. Case Report

A 39-year-old male presented to the emergency department after sustaining a 4-meter fall from a roof on June 3, 2013. On arrival, the patient was conscious with a Glasgow Coma Score of 15 and exhibited no neurological deficits. Cervical and thoracic imaging revealed a posteriorly displaced Type II odontoid fracture (Anderson and D'Alonzo classification) and a T5 rotational burst fracture-dislocation [4]. Cervical CT imaging confirmed posterior displacement of the odontoid (see Figure 1), while thoracic CT imaging revealed a T5 rotational burst fracture with minimal canal encroachment. (see Figures 2 and 3). No additional fractures were identified.



**Figure 1:** (A) sagittal and (B) axial CT showing a posteriorly displaced Type II odontoid fracture



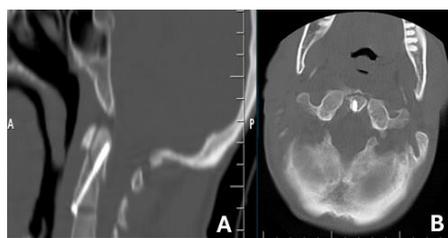
**Figure 2:** (A) sagittal and (B) coronal CT highlighting the T5 burst fracture and rotational deformity



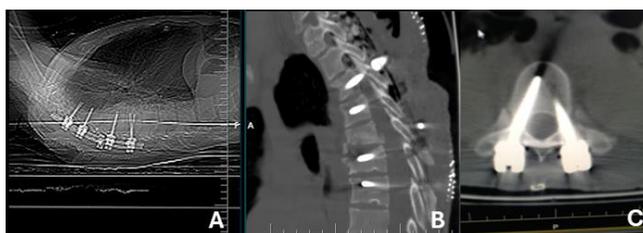
**Figure 3:** (A) sagittal and (B) axial CT demonstrating a T5 rotational burst fracture with minimal canal encroachment

The surgical intervention was performed on the first post-injury day. The odontoid fracture was stabilized by means of anterior odontoid screw fixation (Figure 4). The upper thoracic spine was addressed via a posterior approach, with the placement of

polyaxial screws and rods at T3, T4, T6, and T7, spanning T1-T7 (Figure 5). T5 was not instrumented. Postoperative imaging confirmed satisfactory alignment and fixation. Informed consent was obtained from the patient for the publication of this report.



**Figure 4:** (A) sagittal and (B) axial CT post-anterior odontoid screw fixation showing restored alignment



**Figure 5:** CT (A) scanogram, (B) sagittal and (C) axial views of T1-T7 posterior fixation with screws and rods

## 2. Discussion

The occurrence of combined fractures of the odontoid process and upper thoracic spine is an uncommon phenomenon, indicative of distinct biomechanical forces. The posterior displacement of the Type II odontoid fracture suggests cervical hyperextension, which is consistent with the mechanisms described by Rogers et al. [1]. These researchers reported associated cervical injuries in 35 upper thoracic fracture cases. Conversely, the T5 rotational burst fracture is hypothesized to have resulted from sudden flexion-rotation

forces, a pattern associated with high-energy trauma [3,5]. The stability of the upper thoracic spine, which is facilitated by the rib cage, typically necessitates substantial energy for injury, often leading to neurological deficits in 85% of cases [6]. The patient's remarkable resilience in maintaining neurological integrity in the face of such a severe injury is noteworthy. The absence of spinal cord injury despite the narrow upper thoracic canal may be attributed to limited canal intrusion by fracture fragments, akin to osteoporotic vertebra plana. Biomechanical studies suggest that

axial loading in burst fractures can be mitigated by degenerated discs or reduced bone mass, decreasing canal encroachment [9]. In this case, the rotational component and minimal fragment displacement likely spared the cord, aligning with findings from modern imaging analyses of thoracic trauma [10].

A surgical approach that combines anterior odontoid fixation with posterior thoracic stabilization is recommended, as supported by recent literature on multilevel spinal injuries [11]. Anterior screw fixation effectively restores C1-C2 stability in Type II odontoid fractures, while posterior fusion addresses the instability and rotational deformity at T5 [12]. This dual approach stands in contrast to single-level fixation studies, underscoring the necessity for individualized treatment in complex cases [13]. The postoperative outcomes further substantiate the efficacy of this strategy, with no complications observed. This case contributes to the understanding of multilevel spinal trauma by illustrating a rare injury pattern and its successful management. It underscores the protective role of biomechanical factors in neurological preservation and the value of combined stabilization techniques, aligning with contemporary trends in spinal surgery [14].

### 3. Conclusion

This exceptional instance of concomitant odontoid and T5 fractures exemplifies the viability of combined anterior-posterior stabilization and underscores the necessity of comprehending injury biomechanics to enhance outcomes in intricate spinal trauma cases [7,8].

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